

Union of Soviet
Socialist
Republics



Committee
on Inventions and Discoveries
Council of Ministers
of the USSR

DESCRIPTION OF AN INVENTION

For an Inventor's Certificate

366857

[stamp]

NATIONAL REFERENCE LIBRARY
OF SCIENCE AND INVENTION
26FEB1974

Division of inventor's certificate no.: —

Filed: 7/1/68 (No. 1252006/31-16)

with addition of application no. —

Int.Cl. A 61 B 6/00

Priority: —

Published: 1/23/73, Bulletin No. 8

UDC 615.471:616-072.2:
621.396.61 (088.8)

Publication date of description: 4/9/73

Inventors: V.M. Pluzhnikov, K.D. Kalantarov, Iu.Ia. Gugnin, V.S. Semenov,
V.V. Zelenina, and A.I. Filatov

Applicant: All-Union Scientific Research Institute for Medical Instrument Construction
and the Moscow Engineering Physics Institute

RADIOPILL (RADIO PILL) FOR MEASURING IONIZING RADIATION (RADIOACTIVITY) IN THE GASTROINTESTINAL TRACT

1

The invention relates to devices for measuring radioactivity in human body cavities, in particular to radiocapsules (radio pills) for measuring radioactivity in the gastrointestinal tract.

Known radiocapsules for measuring radioactivity in the gastrointestinal tract which contain a miniature Geiger counter, an emitter of radio signals, and an autonomous power source are very complex to make and are comparatively large; moreover, the broad frequency spectrum of the radio signals of the transducer and also the great complexity of the working pulses make it difficult to isolate a useful signal and require great complexity in the receiver-analyzer and limit the system's resolving power.

The proposed radiocapsule differs from known ones in that the emitter is made in the form of a sine wave oscillator with a piezoceramic transformer filter whose output circuit is loaded by an ionizing radiation counter. Designing the radiocapsule in this way makes it possible to increase the recording quality by increasing the output power of the emitter and reducing the size of the radiocapsule.

The drawing shows the main circuit of the proposed

2

radiocapsule (radio pill).

The radiocapsule contains an emitter, which is made in the form of a sine wave oscillator. The oscillator is built on a microtransistor 1 and a piezoceramic transformer filter 2. The output circuit of the latter has a miniature hemispherical Geiger counter 10 connected to it through a rectifier at microdiodes 3-6 and microcapacitors 7-9. The radiocapsule is powered by an autonomous miniature source 11.

To reduce the size and increase the reliability of the radiocapsule, it combines several functions in one element. The positive feedback necessary for exciting the oscillator is fed from the collector of microtransistor 1 to the base through the piezoceramic transformer filter 2 and connection capacitor 12. The necessary gain is provided by resistor 13 together with inductance 14, which simultaneously performs the function of a correcting device, providing a mode of operation of the transformer filter with a maximum transformation coefficient, and is also an element of the radio signal emitter system. The transformer filter simultaneously increases the high-frequency voltage taken

from the collector of oscillator microtransistor 1. The increased voltage after rectification supplies counter 10. The parameters of the circuit elements and, above all, the resonating dimensions and degree of polarization of the transformer filter are selected in such a way as to ensure, not only optical mode of operation of the oscillator and maximum transformation coefficient, but also modulation of the oscillator's radio signal without introducing additional modulator devices.

The principle of operation of the radiocapsule is based on amplitude modulation of the oscillator's radio signal by a discharge in counter 10, which is accomplished in a negative manner. In the absence of ionizing radiation the rectifier load resistance is, for example, $10^{12} \Omega$. At the same time, the oscillator emits maximum-amplitude electromagnetic oscillations. If, in the counter, there should be a discharge caused by an ionizing particle, its resistance falls to several megohms, which causes a substantial decrease in the amplitude of the oscillator's oscillations, and causes the modulation of the radio signal, and also quenching of the discharge in the counter. The oscillations are stopped by a disturbance in the balance of phases and amplitudes in the oscillator's feedback circuit when the load is removed.

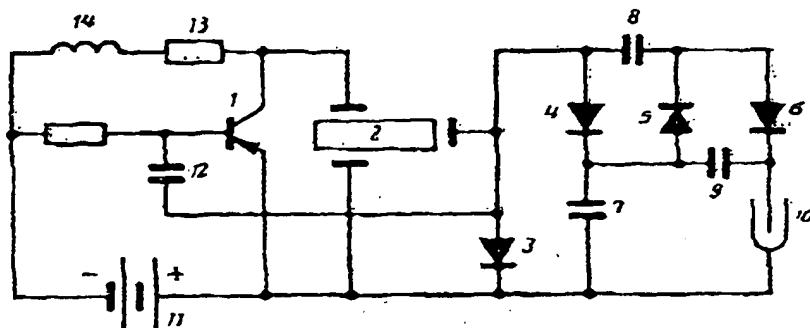
Such

a mode of operation is ensured by the degree of polarization of the material of the transformer filter when it is produced, and also by the selection of the circuit parameters.

The use in the oscillator circuit of a piezoceramic transformer filter fulfilling the function of the resonator, transformer, feedback element, and modulator gives the device a high efficiency (up to 0.95) and high output emission power, which makes it possible to get a good radio bearing on the capsule as it moves in the gastrointestinal tract.

Subject of the Invention

Radiocapsule (radio pill) for measuring ionizing radiation (radioactivity) in the gastrointestinal tract, comprising a miniature Geiger counter, a radio signal emitter, and an autonomous power source, characterized by the fact that in order to increase the recording quality by increasing the output power of the emitter and to decrease the size of the radiocapsule, the emitter is made in the form of a sine wave oscillator with a piezoceramic transformer filter, whose output circuit is loaded with an ionizing radiation counter.



Author E. Lantsburg

Editor L. Berdnik

Technical editor T. Kurliko

Proofreader L. Tsar'kova

Order 747/2

Edition No. 1177

Quantity printed 467

Subscription publication

VNIUPI of the State Committee on Inventions and Discoveries of the Council of Ministers of the USSR

[113035 USSR] Moscow Zh-35, Raushskaya nab. 4/5

Typography, pr. Sapunova, 2